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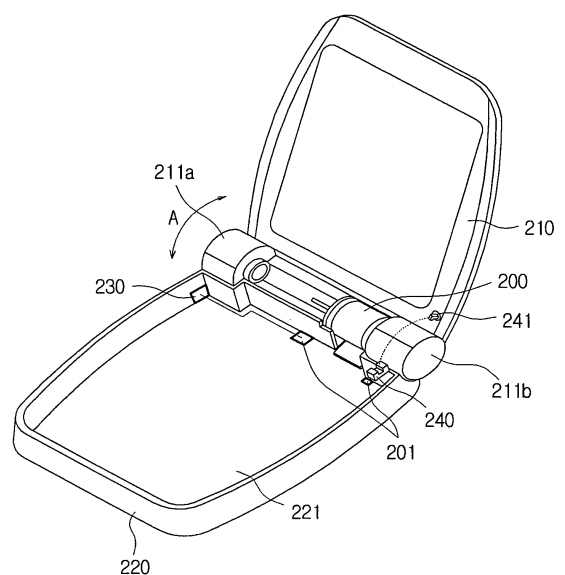
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(54) **Case module having auto-folder function and control method thereof**

(57) A case module and a method for controlling the cover rotation of the case module. The case module comprises a case, the case comprising a motor, the motor enabling a cover to rotate, said cover opening when a forward rotation switch is turned on, said cover closing when a reverse rotation switch is turned on; a buffer, the buffer generating a forward rotation signal or a reverse rotation signal, the forward rotation signal and the reverse rotation signal corresponding to the turn-on state of said forward rotation switch or said reverse rotation switch, respectively; and a driving unit, the driving unit rotating said motor, said motor using a signal from said buffer as an input. The case module and the controlling method thereof control the forward rotation and the reverse rotation of the DC motor and have the cover open and close according to the rotation of the DC motor by use of the driving circuit such that the inconvenience of having to manually open and close the cover is eliminated.

Fig. 2



Description**BACKGROUND OF THE INVENTION**

1. Field of the Invention

[0001] The present invention is related to a case module, more specifically to a case module for an auto-folder function controlling automatic opening and closing of the cover of the case with a receptacle.

[0002] A variety of uses are possible for a portable case with receptacle space. Representative among these are cosmetics cases. It is common that women carry cosmetics, such as mascara, eye shadow, and lipstick, in a case. Also, women often carry a compact, in which compressed powder is filled. These cosmetics cases accompanied inconvenience of having to open the cover with one hand, and at time with two hands.

2. Description of Related Art

[0003] Fig. 1 is an exploded perspective view of a cosmetics case, having an automatic ejection function, in accordance with the prior art.

[0004] The cosmetics case includes a housing 10 containing a receptacle 40 for storing various types of coloring cosmetics defined by a plurality of partitions 41, a drawer 30 for accommodating a cosmetic set 35, and a receiving room 13 for storing the drawer 30. A cover 50 is mounted to the rear wall through a pair of pivot pins such that the cover 50 can be opened and closed. An entrance 11 is disposed at a right wall 10d of the receiving room of the housing. A pair of walls 12 guide an elastic spring 12a, which is mounted against a left wall 10c. A groove 13a is disposed on the bottom and extends from the middle portion of a front wall 10a. A key plate is seated in the groove 13a. An opening spring part 16 is disposed on a rear wall 10b. A locking holder seat 14 is disposed at the center of the front wall 10a with a pair of biased elements 14a. A locking holder 20 includes a locking hook 21 disposed on the top thereof, a pair of elastic wedges 23 extending from both ends thereof, and a key plate 22 having a key projection 22a.

[0005] When the user pushes the locking holder, the drawer is released, and the cover is opened simultaneously, allowing the user to take out the cosmetic set 35 from the drawer 30 and storing the cosmetic set 35 in the drawer 30.

[0006] Referring to Fig. 1, the elasticity of the elastic spring releases the drawer 30. However, the user still has been experiencing inconvenience of having to manually open the cover 50 of the cosmetics case.

[0007] Recently, the popularity of automated products is booming throughout the world. Automation is attempted in small, portable products as well as in large products, such as the robots in manufacturing facilities.

[0008] Take the mobile phone, which almost everyone has these days, for example. It comes in a variety of styles, from the flip style to the folder style to the slide style. Some of the folder style phones, in particular, are produced with an automated function, called the "auto-folder." That is, when the user needs to open the folder to use various functions of a folder-style mobile phone, pressing a predesignated button opens, and closes in effect, the folder such that the inconvenience of manually having to open the folder is eliminated.

[0009] Therefore, it is logical to introduce the auto-folder function to a portable case, such as the cosmetics case.

SUMMARY OF THE INVENTION

[0010] Therefore, the present invention aims to provide a case module and a controlling method thereof to eliminate the inconvenience of having to open and close the cover by using a driving circuit to control the forward and reverse rotations of a DC motor and to have the cover open and close in accordance with the rotation of the DC motor.

[0011] Moreover, the present invention aims to provide a case module and a controlling method thereof that do not require a microcomputer, as mobile phones do, by controlling the rotation direction of a DC motor through the use of a simple circuit to have the cover open and close.

[0012] Other objects of the present invention shall be easily understood through the description below.

[0013] In order to achieve the above objects, an aspect of the present invention features a case module. The case module can comprise a case, a buffer, and a driving unit. The case comprises a motor, which enables a cover to rotate. The cover opens when a forward rotation switch is turned on, and the cover closes when a reverse rotation switch is turned on. The buffer generates a forward rotation signal or a reverse rotation signal, corresponding to the turn-on state of the forward rotation switch or the reverse rotation switch, respectively. The driving unit rotates the motor, using a signal from the buffer as an input.

[0014] Preferably, the case comprises a housing, which has a receptacle isolated from the outside by the cover, and hinges, which connects the cover to the housing such that the cover rotates about the hinges. The motor is disposed inside the hinges such that the motor rotates the cover.

[0015] Here, the reverse rotation switch can be turned on when the cover opens and turned off when the cover covers

the housing. The buffer can generate the forward rotation signal when both the forward rotation switch and the reverse rotation switch are turned on.

[0016] Moreover, the case module can further comprise a cover open state sensing unit, which generates an open signal by sensing the opening of the cover to a predetermined angle. The buffer generates a stop signal, which stops the rotation of the motor in accordance with the open signal.

[0017] Here, the cover open state sensing unit can comprise a voltage source, which provides an open voltage, a sensor PCB (printed circuit board), which generates the open signal by sensing the open voltage at a predetermined location, and a conductive arm, which rotates by the rotation of the motor and connects the voltage source and the sensor PCB at the predetermined location.

[0018] The driving unit can comprise a first driving unit, which rotates the motor in the forward direction in accordance with the forward rotation signal from the buffer, and a second driving unit, which rotates the motor in the reverse direction in accordance with the reverse rotation signal from the buffer.

[0019] The driving unit can be an H-bridge circuit to rotate the motor in the forward direction or the reverse direction in accordance with the forward rotation signal or the reverse rotation signal, respectively.

[0020] Moreover, the case module can further comprise a magnet, which forms a certain intensity of magnetic field by being disposed in either the cover or the housing, and a hall sensor, which senses the magnetic field by being disposed in the other of the cover or the housing where the magnet is disposed. The location of the hall sensor corresponds to the location of the magnet. The hall sensor generates a signal as the magnet nears the hall sensor and delivers the signal, which stops the reverse rotation of the motor, to the buffer.

[0021] The case module can further comprise a drawer, which is housed in the housing and has a small storage space, and a main switch, which structurally opens the storage. The drawer turns off the forward rotation switch when the drawer is housed in the housing and turns on the forward rotation switch when the drawer is released from the housing.

[0022] In order to achieve the above objects, another aspect of the present invention features a method for controlling the cover rotation of a case module. The case module comprises a motor, a forward rotation switch, and a reverse rotation switch. The motor rotates a cover, and the switches open or close the cover. The method can comprise the steps of (a) generating a forward rotation signal when the forward rotation switch is turned on, (b) rotating the motor in the forward direction in accordance with the forward rotation signal, (c) the cover being opened in accordance with the forward rotation of the motor, (d) sensing the opening of the cover to a predetermined angle, and (e) generating a stop signal, which stops the forward rotation of the motor.

[0023] Preferably, the case module can further comprise a cover open state sensing unit, which generates an open signal by sensing the opening of the cover to the predetermined angle. The step (d) can generate a stop signal, which stops the rotation of the motor in accordance with the open signal.

[0024] Here, the cover open state sensing unit can comprise a voltage source, which provides an open voltage, a sensor PCB (printed circuit board), which generates the open signal by sensing the open voltage at a predetermined location, and a conductive arm, which rotates by the rotation of the motor and connects the voltage source and the sensor PCB at the predetermined location.

[0025] Preferably, the step (c) can turn on the reverse rotation switch when the cover opens.

[0026] Here, the method can further comprise the steps of (f) generating a reverse rotation signal, which rotates the motor in the reverse direction, when the forward rotation switch is turned off, (g) rotating the motor in the reverse direction in accordance with the reverse rotation signal, (h) the cover covering the housing in accordance with the reverse rotation of the motor, and (i) generating the stop signal, which stops the reverse rotation of the motor.

[0027] The case module can further comprise a magnet, which is disposed in either the cover or the housing and forms a certain intensity of magnetic field, and a hall sensor, which is disposed in the other of the cover or the housing where the magnet is disposed and senses the magnetic field. The location of the hall sensor corresponds to the location of the magnet. The step (f) generates the stop signal as the magnet nears the hall sensor.

[0028] The case module can further comprise a drawer, which is housed in the housing and has a small storage space, and a main switch, which structurally opens the storage. The drawer turns off the forward rotation switch when the drawer is housed in the housing and turns on the forward rotation switch when the drawer is released from the housing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description, appended claims, and accompanying drawings where:

Fig. 1 shows an exploded perspective view of a cosmetics case, having an automatic ejection function, in accordance with the prior art;

Fig. 2 illustrates a case in accordance with a preferred embodiment of the present invention;

Fig. 3 shows perspective views of a case with the cover opened and closed, in accordance with another preferred

embodiment of the present invention;

Fig. 4 shows an exploded perspective view of the case without the upper housing;

Fig. 5 shows an enlarged view of a section of Fig. 4;

Fig. 6 shows a schematic of a case cover rotation control circuit in accordance with a preferred embodiment of the present invention;

Fig. 7 illustrates a method of the sensor PCB (printed circuit board) inside the motor for sensing the complete opening of the cover;

Fig. 8 shows a case cover rotation control circuit using an H-bridge circuit in accordance with another preferred embodiment of the present invention; and

Figs. 9-10 show flowcharts of a method for controlling the case cover rotation in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0030] Hereinafter, preferred embodiments of a case module and its controlling method thereof in accordance with the present invention will be described with reference to the accompanying drawings. In describing the present invention, if it is determined that detailed description of a certain pertinent technology, known to those of ordinary skill in the art, can make the essence of the present invention obscure, the detailed description of the pertinent technology will not be provided. The ordinal numbers (e.g. the first, the second, etc.) used in the description are only for the purpose of distinguishing similar elements in the order of appearance in the description.

[0031] The case module of the present invention comprises a case and a case cover rotation control circuit. The case will be described in detail through Figs. 2-5, and the case cover rotation control circuit and its operation will be described in detail through Figs. 6-8.

[0032] Fig. 2 is an illustration of the case in accordance with a preferred embodiment of the present invention.

[0033] Referring to Fig. 2, the case comprises a cover 210, a housing 220, a forward rotation switch 230, a reverse rotation switch 240, hinges 211a, 211b, and a motor 200.

[0034] The housing 220 includes a receptacle 221, which is isolated from the outside by the cover 210.

[0035] The forward rotation switch 230 is disposed on the outside of the housing 220. Turning on the forward rotation switch 230 generates a forward rotation signal, which rotates the motor 200 forward, and delivers the signal to the motor 200 through a connection terminal 201. Turning off the forward rotation switch 230 stops the generation of the forward rotation signal.

[0036] The reverse rotation switch 240 is disposed on the upper part of where the cover 210 and the housing 220 make contact when the cover 210 covers the housing 220. A push pin 241, which turns off the reverse rotation switch 240, is disposed at a location on the surface of the cover 210 corresponding to the location of the reverse rotation switch 240. When the cover 210 opens, the cover 210 loses contact with the housing 220, and subsequently the push pin 241 loses contact with the reverse rotation switch 240, thereby turning on the reverse rotation switch 240. Then, a reverse rotation signal, which rotates the motor 200 in the reverse direction, is generated and delivered to the motor 200 through the connection terminal 201.

[0037] Here, the push pin 241 can turn off the reverse rotation switch 240 by mechanically pressing the reverse rotation switch 240. It is also possible to mount a hall sensor on the reverse rotation switch 240 and a magnet on the push pin 241. The magnet creates a certain intensity of magnetic field, and the hall sensor senses the magnetic field. In other words, when the magnet and the hall sensor become narrower than a predetermined distance, the intensity of the magnetic field increases, and the output of the hall sensor becomes high; when the magnet and the hall sensor become wider than a predetermined distance, the intensity of the magnetic field decreases, and the output of the hall sensor becomes low. Using this, the reverse rotation of the motor can be stopped by making the reverse rotation switch turn off if the output of the hall sensor becomes high.

[0038] In the present invention, while the cover 210 is opening because the forward rotation switch 230 is turned on, the reverse rotation switch 240 is turned on also. However, it is preferable that the reverse rotation signal is not generated while the forward rotation signal is generated.

[0039] The cover 210 and the housing 220 are connected through the hinges 211 a, 211b. The hinges 211a, 211b allow the cover 210 to rotate about the hinges 211a, 211b.

[0040] The motor 200 is disposed inside the hinges 211a, 211b. The motor 200 is a DC motor, which is capable of rotating forward and backward or stopping, in accordance with the applied driving signal. The embodiment can further comprise a gear to reduce the speed of the rotation of the motor 200 by a predetermined proportion, making the cover 210 rotate in the A direction only within 360 degrees.

[0041] Fig. 3 shows perspective views of a case with the cover opened and closed, in accordance with another preferred embodiment of the present invention. Fig. 4 is an exploded perspective view of the case without the upper housing. Fig. 5 is an enlarged view of a section of Fig. 4.

[0042] The case illustrated in Figs. 3-5 shows an example of a cosmetics case having a first receptacle 322, for storing cosmetics such as coloring cosmetics or compressed powder, and a drawer 350, which includes a second receptacle 352 for storing a cosmetic set for use of the above cosmetics. Of course, the present invention is not limited to cosmetic cases and can be applied to any case that requires two receptacles.

[0043] The case comprises a cover 310, an upper housing 320a, a lower housing 320b, a drawer 350, hinges 311a, 311b, and a reverse rotation switch 340.

[0044] The upper housing 320a includes the first receptacle 322 and is in direct contact with the cover 310. The reverse rotation switch 340 and a push pin 341 can be disposed on the upper housing 320a and the cover 310, respectively.

[0045] The lower housing 320b supports the upper housing 320a, and houses the drawer 350, which includes the second receptacle 352, between the upper housing 320a and the lower housing 320b. A guide rail 356 is disposed on the bottom surface of the lower housing 320b such that the drawer 350 can be slid out in the C direction, as illustrated in Fig. 3.

[0046] The drawer 350 includes the second receptacle 352 and can be drawn out in the C direction through a groove disposed on one side that is open when the upper housing 320a and the lower housing 320b are coupled. The drawer is drawn out in a sliding method in order to protect the contents in the second receptacle 352 from a sudden projection. For this, the drawer 350 has a transfer roller 354 (refer to Fig. 4) engaged with the guide rail 356 disposed on the bottom surface of the lower housing 320b.

[0047] The drawer 350 has a fixed groove (not illustrated), to which a fixed hook 332 is engaged, such that the drawer 350 is not drawn out unless it is necessary. However, if a main switch 330, which is integrated in the fixed hook 332, is pressed to the inside of the lower housing 320b, the fixed hook 332 departs from the fixed groove of the drawer 350, thereby projecting the drawer 350 to the outside. The drawing of the drawer 350 can be driven by either the gravity or the elasticity of a spring.

[0048] When the drawer 350 is fixed by the fixed hook 332 and thus not drawn out, the drawer keeps the forward rotation switch 331 pressed. The pressing operation turns off the forward rotation switch 331, and therefore the forward rotation signal is not generated. However, if the drawer 350 is drawn out to the outside by pressing the main switch 330, the pressure on the forward rotation switch applied by the drawer becomes released, and the forward rotation switch 331 is turned on. This subsequently generates a forward rotation signal and rotates the motor 300 disposed inside the hinges 311a, 311b in the forward direction along with the projection of the drawer 350.

[0049] The main switch 330 is connected to a fixed block 334, disposed on the lower housing 320b, through a spring 333 such that it returns to the original position when the external pressure is removed. Thus, the fixed hook 332, integrated in the main switch 330, also returns to the original position, and fixes the drawer 350 by engaging the fixed hook 332 in the fixed groove of the drawer 350 when the drawer 350 is later inserted.

[0050] The forward rotation switch 331 is disposed inside the lower housing 320b, and is turned off when it is pressed by the drawer 350. When the drawer 350 is ejected, the pressure is removed, and subsequently the forward rotation switch 331 is turned on. Turning on the forward rotation switch 331 generates a forward rotation signal, which rotates the motor 300 in the forward direction, and delivers the signal to the motor 300 through a connection terminal. When the forward rotation switch 331 is turned off, the generation of the forward rotation signal is stopped.

[0051] The reverse rotation switch 340 is disposed at a location on the upper housing 320a where the cover 310 and the upper housing 320a make contact when the cover 310 covers the upper housing 320a. The push pin 341, which turns off the reverse rotation switch 340, is disposed on the surface of the cover 310 corresponding to the location of the reverse rotation switch 340. When the cover 310 opens, the reverse rotation switch 340 loses contact with the upper housing 320a, and subsequently the push pin 341 loses contact with the reverse rotation switch 340, thereby turning on the reverse rotation switch 340. Then, a reverse rotation signal, which turns the motor 300 in the reverse direction, is generated and delivered to the motor 300 through the connection terminal.

[0052] Here, the push pin 341 can turn off the reverse rotation switch 340 by mechanically pressing the reverse rotation switch 340. It is also possible to mount a hall sensor on the reverse rotation switch 340 and a magnet on the push pin 341. The magnet creates a certain intensity of magnetic field, and the hall sensor senses the magnetic field. In other words, when the magnet and the hall sensor become narrower than a predetermined distance, the intensity of the magnetic field increases, and the output of the hall sensor becomes high; when the magnet and the hall sensor become wider than a predetermined distance, the intensity of the magnetic field decreases, and the output of the hall sensor becomes low. Using this, the reverse rotation of the motor 300 can be stopped by making the reverse rotation switch 340 turn off if the output of the hall sensor becomes high.

[0053] In the present invention, while the cover 310 is opening because the forward rotation switch 331 is turned on, the reverse rotation switch 340 is turned on also. However, it is preferable that the reverse rotation signal is not generated while the forward rotation signal is generated.

[0054] The cover 310 and upper housing 320a or the upper housing 320a and lower housing 320b are combined through the hinges 311a, 311b such that the cover 310 can be rotated in the B direction (as shown in Fig. 3(a)).

[0055] The motor 300 is disposed inside the hinges 311a, 311b. The motor 300 is a DC motor, which is capable of

rotating forward and backward or stopping, in accordance with the applied driving signal. The embodiment can further comprise a gear to reduce the speed of the rotation of the motor 300 by a predetermined proportion, making the cover 310 rotate in the B direction only within 360 degrees.

[0056] Hereinafter, a case cover rotation control circuit for driving the motor 200, 300 by the forward rotation switch 230, 331 and the reverse rotation switch 240, 340 will be described.

[0057] Fig. 6 is a schematic of a case cover rotation control circuit in accordance with a preferred embodiment of the present invention. Fig. 7 is a diagram showing a method of the sensor PCB inside the motor for sensing the complete opening of the cover.

[0058] Referring to Fig. 6, the circuit comprises a motor 300, a sensor PCB 610 inside the motor 300, an open signal generating unit 620, a forward rotation switch 230, 331, a reverse rotation switch 240, 340, driving units 650a, 650b, and a buffer 660.

[0059] The buffer 660 generates a forward rotation signal or a reverse rotation signal, depending on the turn on/off of the forward rotation switch 230, 331 and reverse rotation switch 240, 340.

[0060] The driving units 650a, 650b are connected to the buffer to receive the forward rotation signal or the reverse rotation signal, and rotate the motor in the forward direction or reverse direction accordingly. The operating principle of the case cover control circuit is as follows:

[0061] The operation mode of the forward rotation switch 331 and the reverse rotation switch 340 is shown in Table 1, and the operation mode of the buffer 660 is shown in Table 2, indicating the signal at the sensor PCB 610 inside the motor 300.

[Table 1]

	Forward rotation switch	Reverse rotation switch
Switch is pressed	OPEN	OPEN
Switch is not pressed	SHORT	SHORT

[0062] Here, OPEN means turning on the switch, and SHORT means turning off the switch.

[Table 2]

INPUT(A)	OUTPUT(Y)	CONTROL(C)
X	OPEN	H
L	L	L
H	H	L

[0063] Here, H refers to "high", L refers to "low", and X refers to "irrelevant." The output for the input is provided from the buffer 660 when the control signal is L.

[Table 3]

Case remains closed	L
Case opens	L
Case is completely opened	H
Case closes	L
Case is completely closed	L

[0064] Here, the motor 300 operates in accordance with the input signal (i.e. forward rotation signal) from Y0 and Y1 (forward operation) or the input signal (i.e. reverse rotation signal) from Y2 and Y3 (reverse operation) of the buffer 660. It is not possible to operate in the forward direction and in the reverse direction simultaneously through the signal operation of the buffer 660, but it is possible to operate neither in the forward direction nor in the reverse direction simultaneously.

[0065] Hereinafter, the operating principle of the case with a dual receptacle structure, shown in Fig. 3, will be described.

[0066] When the cover 310 remains closed, the drawer 350 is inserted between the upper housing 320a and the lower housing 320b. At this time, structurally, the drawer 350 is made to press the forward rotation switch 331, which becomes an OPEN state. Since the forward rotation switch 331 is in an OPEN state, an H signal is inputted to the C0 pin of the

buffer 660, making the buffer not operate. Thereby, the buffer 660 does not generate a forward rotation signal, and the motor 300 does not rotate in the forward direction. Besides, since the cover 310 is closed, and the push pin 341 is pressing the reverse rotation switch 340, the reverse rotation switch 340 is in an OPEN state, thereby not generating a reverse rotation signal and not rotating the motor 300 in the reverse direction. Therefore, when the cover 310 is closed, the motor 300 is in a stopped state, without any operation.

[0067] When the cover 310 opens, the operation is as follows:

[0068] In order to open the cover 310, the main switch 330 must be pressed. When the main switch 330 is pressed, the drawer 350, which has been structurally fixed by the fixed hook 332, is ejected from the case along the guide rail 356. As the drawer 350 is ejected from the case, the forward rotation switch 331, which has been pressed, becomes open, and the circuit becomes SHORT. By this, an L signal is inputted to the C0 pin and C1 pin of the buffer 660, and a forward rotation signal is applied to the first driving unit 650a, rotating the motor 300 in the forward direction. That is, as the forward rotation switch 331 becomes short, the motor 300 operates, and the cover 310 gets to open. When the cover 310 gets to open, the reverse rotation switch 340, which has been pressed, is no longer pressed, becoming short. However, since an H signal is inputted to the C2 and C3 pins of the buffer 660, a reverse rotation signal is not applied to the second driving unit 650b, not rotating the motor 300 in the reverse direction.

[0069] When the cover 310 is completely opened, the operation is as follows:

[0070] Referring to Fig. 7, the open state of the cover can be detected because of the cover open state sensing unit inside the motor 300. The cover open state sensing unit comprises a sensor PCB 610, in which a part is grounded, an open voltage source 720, having an open voltage (3V in the present embodiment), and a conductive arm 710. The sensor PCB 610 sends out an H signal (OPEN signal) when an open voltage is applied to a certain location, and sends out an L signal otherwise. The conductive arm 710, made of a conductive material, is disposed on the axle of the motor 300, rotating according to the rotation of the motor 300. Preferably, it can be a brush inside the motor 300. In case the cover 310 is open by the angle that the user desires, the conductive arm 710 connects a certain location of the sensor PCB 610 and the open voltage source 720, applying the open voltage to the certain location of the sensor PCB 610. When the sensor PCB 610 sends out an H signal, which is a stop signal of the motor 300, the motor 300 stops its forward rotation and comes to a halt.

[0071] When the cover 310 closes, the operation is as follows:

[0072] In order to close the cover 310, the drawer 350 is inserted into the case. When the drawer 350 is inserted all the way in the case, the drawer 350 presses the forward rotation switch 331. This makes the forward rotation switch 331 become an OPEN state. At this time, since the reverse switch 340 is in a SHORT state, an L signal is inputted to the C2 and C3 pins of the buffer 660, generating a reverse rotation signal, which is then applied to the second driving unit 650b. The second driving unit 650b rotates the motor 300 in the reverse direction according to the applied reverse rotation signal.

[0073] When the cover 310 is completely closed, the operation is as follows:

[0074] As the cover 310 is completely closed, the push pin 341 of the cover 341 presses the reverse rotation switch 340, making the reverse rotation switch 340 become an OPEN state. Since both the forward rotation switch 331 and the reverse rotation switch 340 are in an OPEN state, an H signal is applied to the control pins (C0, C1, C2, and C3 pins) of the buffer 660, immobilizing the buffer 660. By this, the input signal to the motor 300 is cut off, and the motor 300 stops its reverse rotation and comes to a halt.

[0075] As illustrated in Fig. 7, the first driving unit 650a and the second driving unit 650b can be separately disposed to apply a forward rotation signal or a reverse rotation signal in order to rotate the motor in the forward or reverse direction. However, it is also possible to use an H-bridge circuit.

[0076] Fig. 8 is a case cover rotation control circuit using an H-bridge circuit in accordance with another preferred embodiment of the present invention.

[0077] Referring to Fig. 8, each transistor (TR1, TR2, TR3, TR4) connected to the motor works as a kind of switch. Referring to the truth table of Fig. 8, when an H signal is applied to A and D, and an L signal to the rest, TR1 and TR4 become conductive, making the motor rotate in the forward direction. When an H signal is applied to B and C, and an L signal to the rest, TR2 and TR3 become conductive, making the motor rotate in the reverse direction. When an H signal is applied to A and B or to C and D, the motor stops. Here, each transistor can be a field effect transistor.

[0078] Although the operation of the case cover rotation control circuit of the case with a dual receptacle structure, shown in Fig. 3, has been described, it should be evident that the same description can be applied to the case shown in Fig. 2.

[0079] Figs. 9-10 are flowcharts of a method for controlling the case cover rotation in accordance with a preferred embodiment of the present invention.

[0080] Referring to Fig. 9, the forward rotation switch 331 is structurally pressed, in step S905, to become an OPEN state, which is a turn-on state. In step S910, the buffer 660 generates a forward rotation signal and delivers to the first driving unit 650a. In step S915, the first driving unit 650a rotates the motor 300 in the forward direction in accordance with the inputted forward rotation signal. In step S920, the cover 310, which is connected to the axle of the motor, opens

in accordance with the forward rotation of the motor 300.

[0081] In S925, an open signal about whether the cover open state sensing unit has detected the opening of the cover 310 to a certain angle is generated, through which it is determined whether the buffer 660 has generated a stop signal. If a stop signal is not sensed, steps S915-S925 are repeated. If a stop signal is sensed, the motor 300, which is rotating in the forward direction, is stopped in step S930.

[0082] Referring to Fig. 10, as the cover 310 opens in step S920 of the above steps, the reverse rotation switch 340 opens and becomes a SHORT state, and this causes the reverse rotation switch 340 to turn on, in step S1005. In step S1010, inserting the drawer 350 presses the forward rotation switch 331, and this causes the forward rotation switch 331 to turn off. In step S1015, the buffer 660 generates a reverse rotation signal because the forward rotation switch 331 is turned off and the reverse rotation switch 340 is turned on.

[0083] In step S1020, the second driving unit 650b senses the reverse rotation signal from the buffer 660 and rotates the motor 300 in the reverse direction. In step S1025, the cover 310 rotates and closes in accordance with the reverse rotation of the motor 300.

[0084] In step S1030, when the cover 310 is completely closed on the upper housing 320a, the pushi pin 341 presses the reverse rotation switch 340, turning off the reverse rotation switch 340. Therefore, it is determined whether the cover 310 is completely closed by checking the turn-off state of the reverse rotation switch 340.

[0085] If it is determined that the reverse rotation switch 340 is not turned off, the motor 300 continues its reverse rotation because it means that the cover 300 is still not completely closed. However, if it is determined that the reverse rotation switch 340 is turned off, the reverse rotation of the motor 300 is stopped because it means that the cover 300 is completely closed.

[0086] As described above, the case module and the controlling method thereof in accordance with the present invention control the forward rotation and the reverse rotation of the DC motor and have the cover open and close according to the rotation of the DC motor by use of the driving circuit such that the inconvenience of having to manually open and close the cover is eliminated.

[0087] Since a simple circuit is used to control the rotational direction of the DC motor, thereby opening and closing the cover, it is possible to apply the present invention to a product such as a cosmetics case, which, unlike mobile telephones, does not use a microcomputer.

[0088] Although the preferred embodiments of the present invention have been described, anyone of ordinary skill in the art to which the invention pertains should be able to understand that a very large number of permutations are possible within the spirit and scope of the present invention.

Claims

1. A case module, comprising:

a case, the case comprising a motor, the motor enabling a cover to rotate, said cover opening when a forward rotation switch is turned on, said cover closing when a reverse rotation switch is turned on;
a buffer, the buffer generating a forward rotation signal or a reverse rotation signal, the forward rotation signal and the reverse rotation signal corresponding to the turn-on state of said forward rotation switch or said reverse rotation switch, respectively; and
a driving unit, the driving unit rotating said motor, said motor using a signal from said buffer as an input.

2. The case module of claim 1, further comprising:

a housing, the housing comprising a receptacle, the receptacle being isolated from the outside by said cover; and
hinges, the hinges connecting said cover to said housing, said cover rotating about the hinges,
wherein said motor is disposed inside said hinges, the motor rotating the cover.

3. The case module of claim 2, wherein said reverse rotation switch is turned on when said cover opens and is turned off when said cover covers said housing.

4. The case module of claim 3, wherein said buffer generates said forward rotation signal when both said forward rotation switch and said reverse rotation switch are turned on.

5. The case module of claim 2, further comprising:

a cover open state sensing unit, the cover open state sensing unit generating an open signal by sensing the

opening of said cover to a predetermined angle,
wherein said buffer generates a stop signal, the stop signal stopping the rotation of said motor in accordance with said open signal.

5 6. The case module of claim 5, wherein said cover open state sensing unit comprises:

a voltage source, the voltage source providing an open voltage;
a sensor PCB (printed circuit board), the sensor PCB generating said open signal by sensing said open voltage at a predetermined location; and
10 a conductive arm, the conductive arm rotating by the rotation of said motor, the conductive arm connecting said voltage source and said sensor PCB at said predetermined location.

7. The case module of claim 2, wherein said driving unit comprises:

15 a first driving unit, the first driving unit rotating said motor in the forward direction in accordance with said forward rotation signal from said buffer; and
a second driving unit, the second driving unit rotating said motor in the reverse direction in accordance with said reverse rotation signal from said buffer.

20 8. The case module of claim 2, wherein said driving unit rotates said motor in the forward direction or the reverse direction in accordance with said forward rotation signal or said reverse rotation signal, respectively, the driving unit being an H-bridge circuit.

25 9. The case module of claim 2, further comprising:

a magnet, the magnet forming a certain intensity of magnetic field, the magnet being disposed in either said cover or said housing; and
a hall sensor, the hall sensor sensing said magnetic field, the hall sensor being disposed in the other of said cover or said housing where said magnet is disposed, the location of the hall sensor corresponding to the
30 location of said magnet,
wherein said hall sensor generates a signal as said magnet nears said hall sensor, the hall sensor delivering said signal to said buffer, the signal stopping the reverse rotation of said motor.

35 10. The case module of claim 2, further comprising:

a drawer, the drawer being housed in said housing, the drawer having a small storage space; and
a main switch, the main switch structurally opening said storage,
wherein said drawer turns off said forward rotation switch when said drawer is housed in said housing and turns
40 on said forward rotation switch when said drawer is released from said housing.

11. A method for controlling the cover rotation of a case module, the case module comprising a motor, a forward rotation switch, and a reverse rotation switch, the motor rotating a cover, the switches opening or closing said cover, the method comprising the steps of:

45 (a) generating a forward rotation signal when said forward rotation switch is turned on;
(b) rotating said motor in the forward direction in accordance with said forward rotation signal;
(c) said cover being opened in accordance with the forward rotation of said motor;
(d) sensing the opening of said cover to a predetermined angle; and
(e) generating a stop signal, the stop signal stopping the forward rotation of said motor.
50

12. The method of claim 11, wherein said case module further comprises:

a cover open state sensing unit, the cover open state sensing unit generating an open signal by sensing the opening of said cover to said predetermined angle,
55 wherein said step (d) generates a stop signal, the stop signal stopping the rotation of said motor in accordance with said open signal.

13. The method of claim 12, wherein said cover open state sensing unit comprises:

a voltage source, the voltage source providing an open voltage;
a sensor PCB (printed circuit board), the sensor PCB generating said open signal by sensing said open voltage
at a predetermined location; and
a conductive arm, the conductive arm rotating by the rotation of said motor, the conductive arm connecting said
voltage source and said sensor PCB at said predetermined location.

14. The method of claim 11, wherein said step (c) turns on said reverse rotation switch when said cover opens.

15. The method of claim 14, further comprising the steps of:

(f) generating a reverse rotation signal when said forward rotation switch is turned off, the reverse rotation signal
rotating said motor in the reverse direction;
(g) rotating said motor in the reverse direction in accordance with said reverse rotation signal;
(h) said cover covering said housing in accordance with the reverse rotation of said motor; and
(i) generating said stop signal, the stop signal stopping the reverse rotation of said motor.

16. The method of claim 15, wherein said case module further comprises:

a magnet, the magnet forming a certain intensity of magnetic field, the magnet being disposed in either said
cover or said housing; and
a hall sensor, the hall sensor sensing said magnetic field, the hall sensor being disposed in the other of said
cover or said housing where said magnet is disposed, the location of the hall sensor corresponding to the
location of said magnet,
wherein said step (f) generates said stop signal as said magnet nears said hall sensor.

17. The method of claim 15, wherein said case module further comprises:

a drawer, the drawer being housed in said housing, the drawer having a small storage space; and
a main switch, the main switch structurally opening said storage,
wherein said drawer turns off said forward rotation switch when said drawer is housed in said housing and turns
on said forward rotation switch when said drawer is released from said housing.

Fig. 1

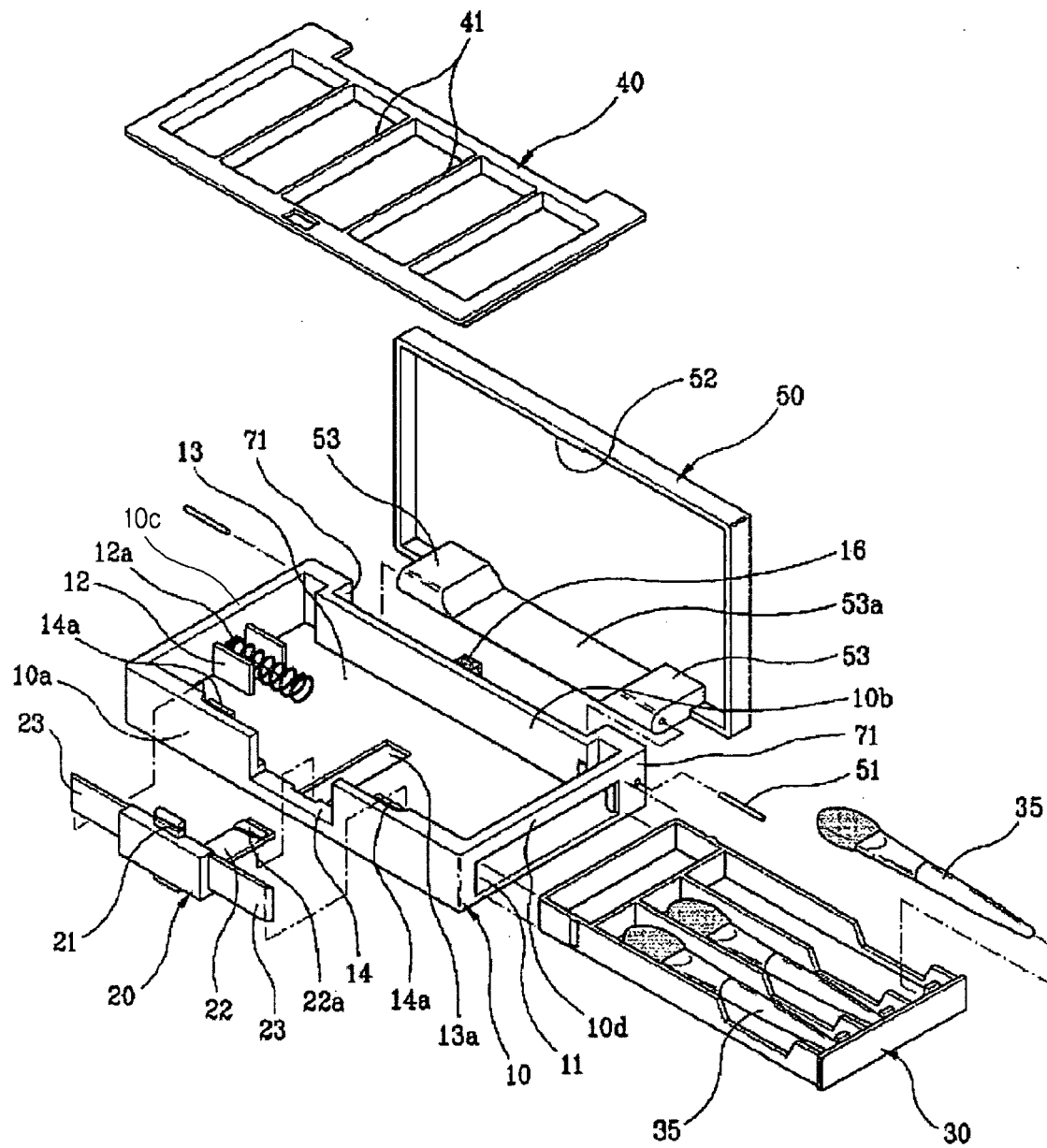


Fig. 2

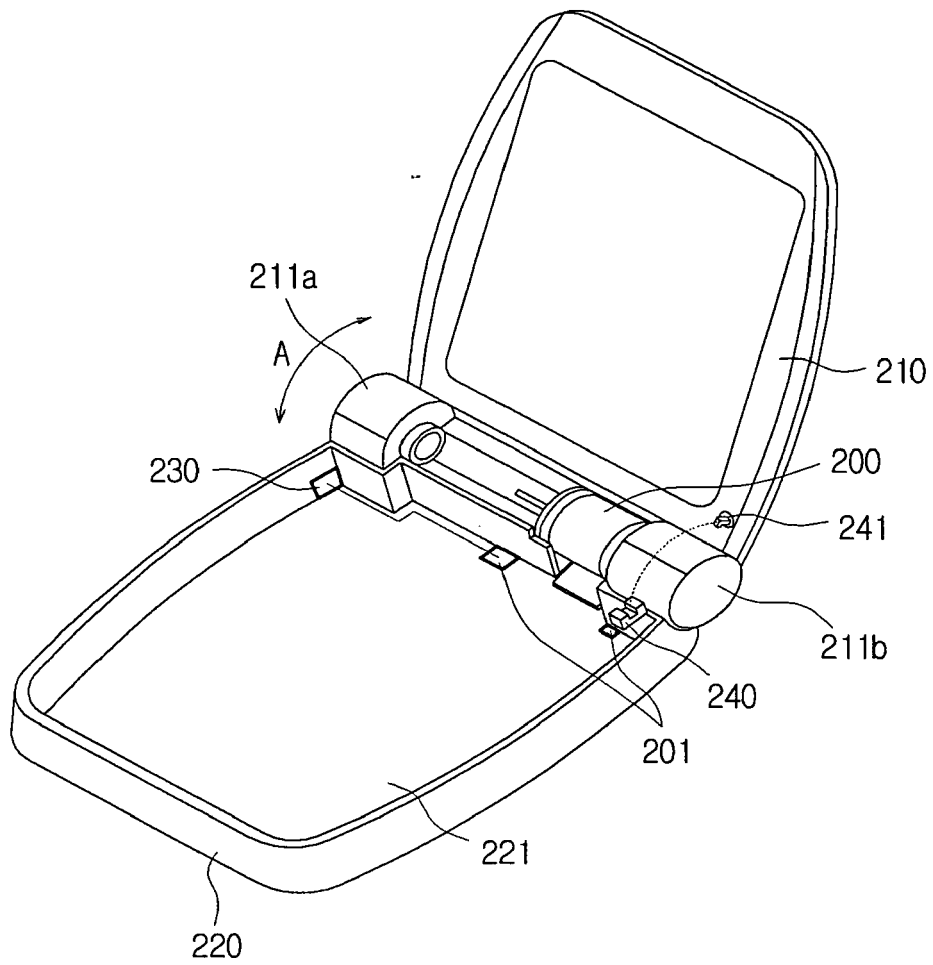


Fig. 3

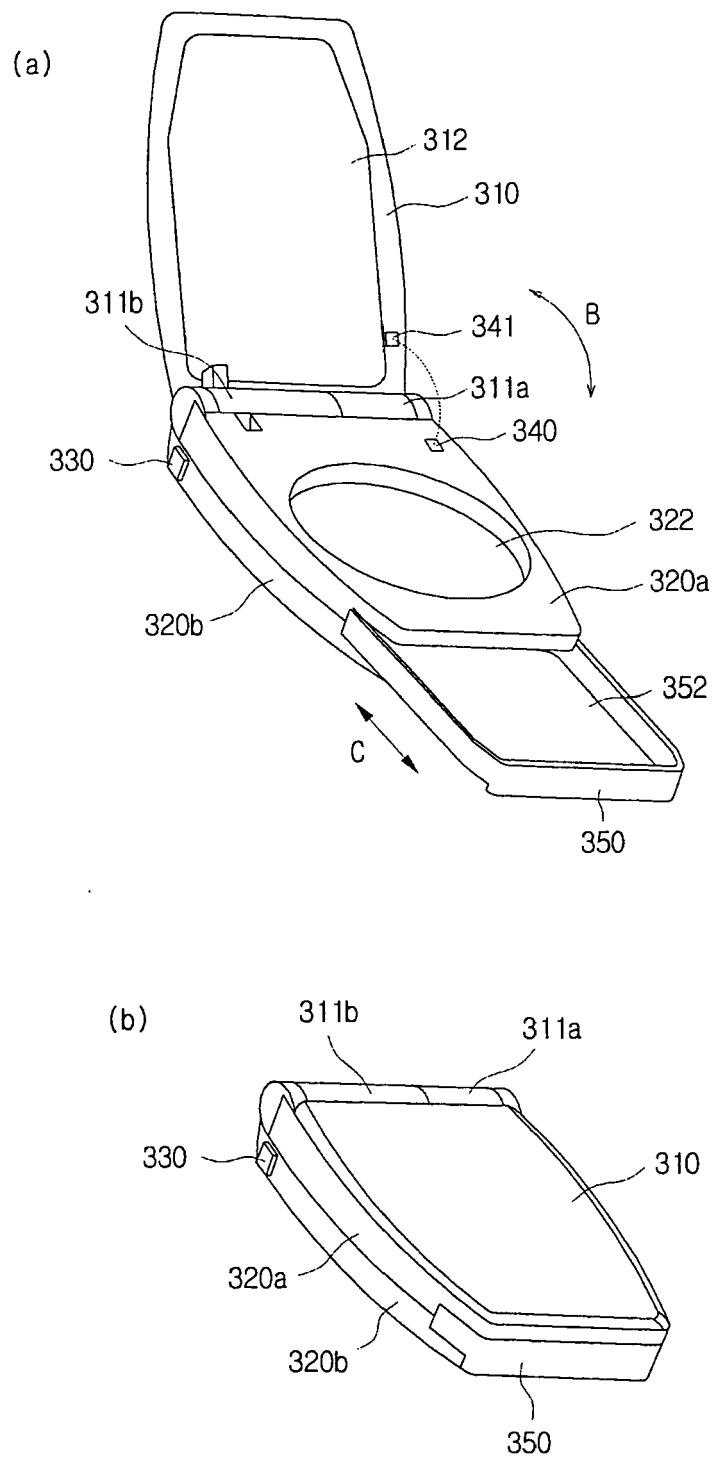


Fig. 4

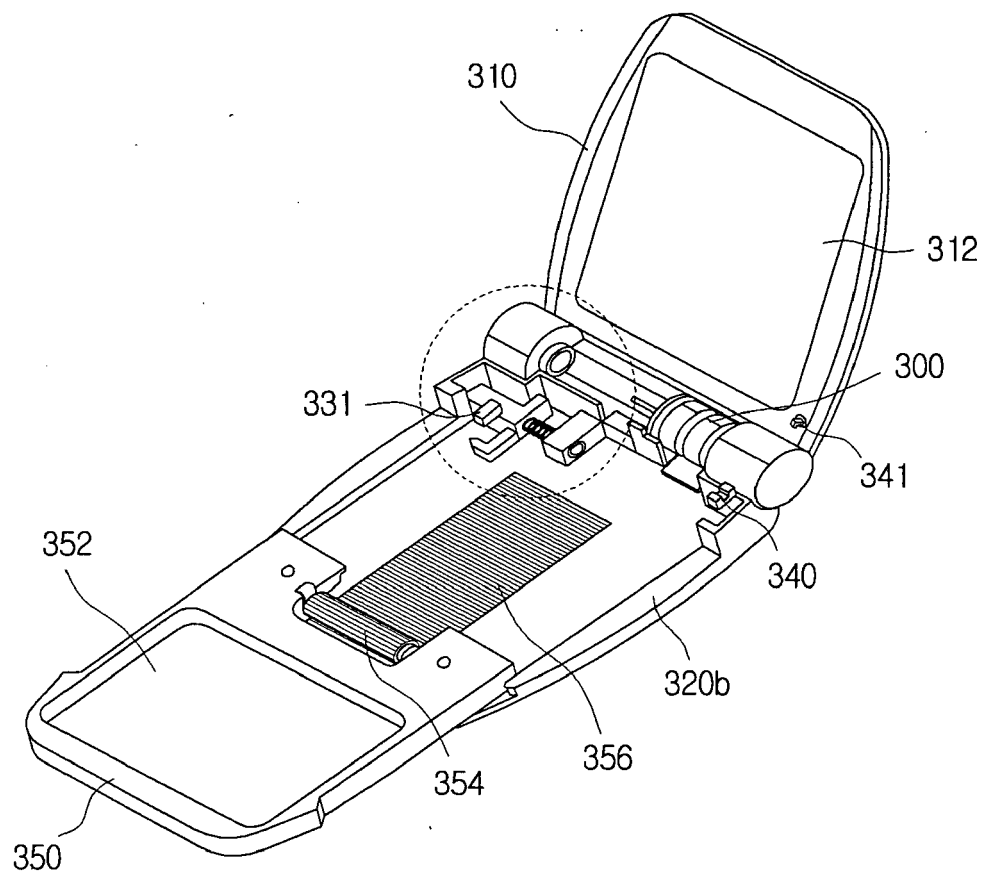


Fig. 5

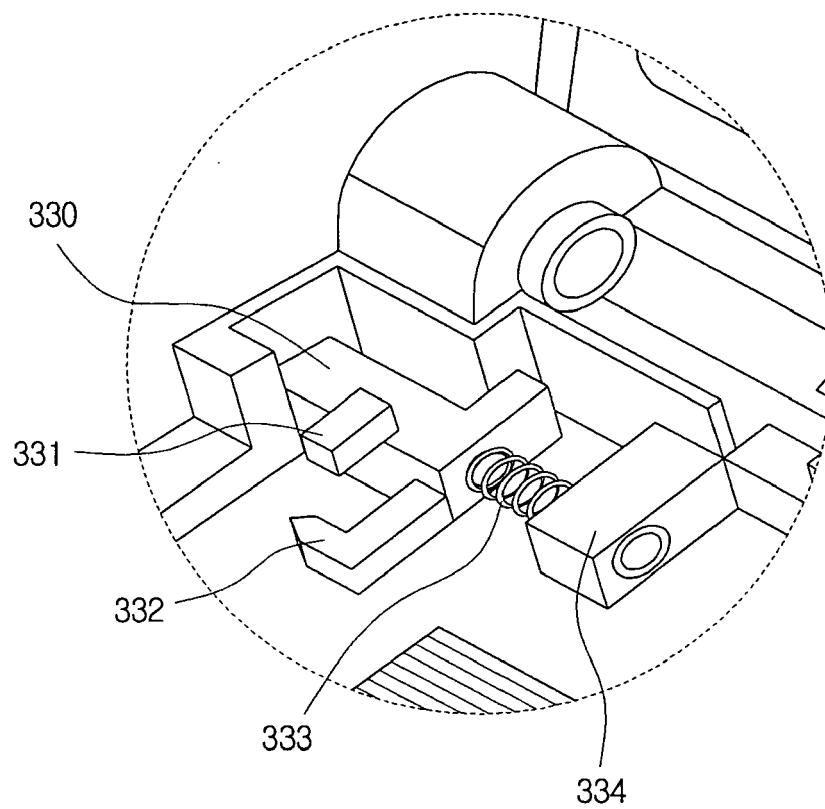


Fig. 6

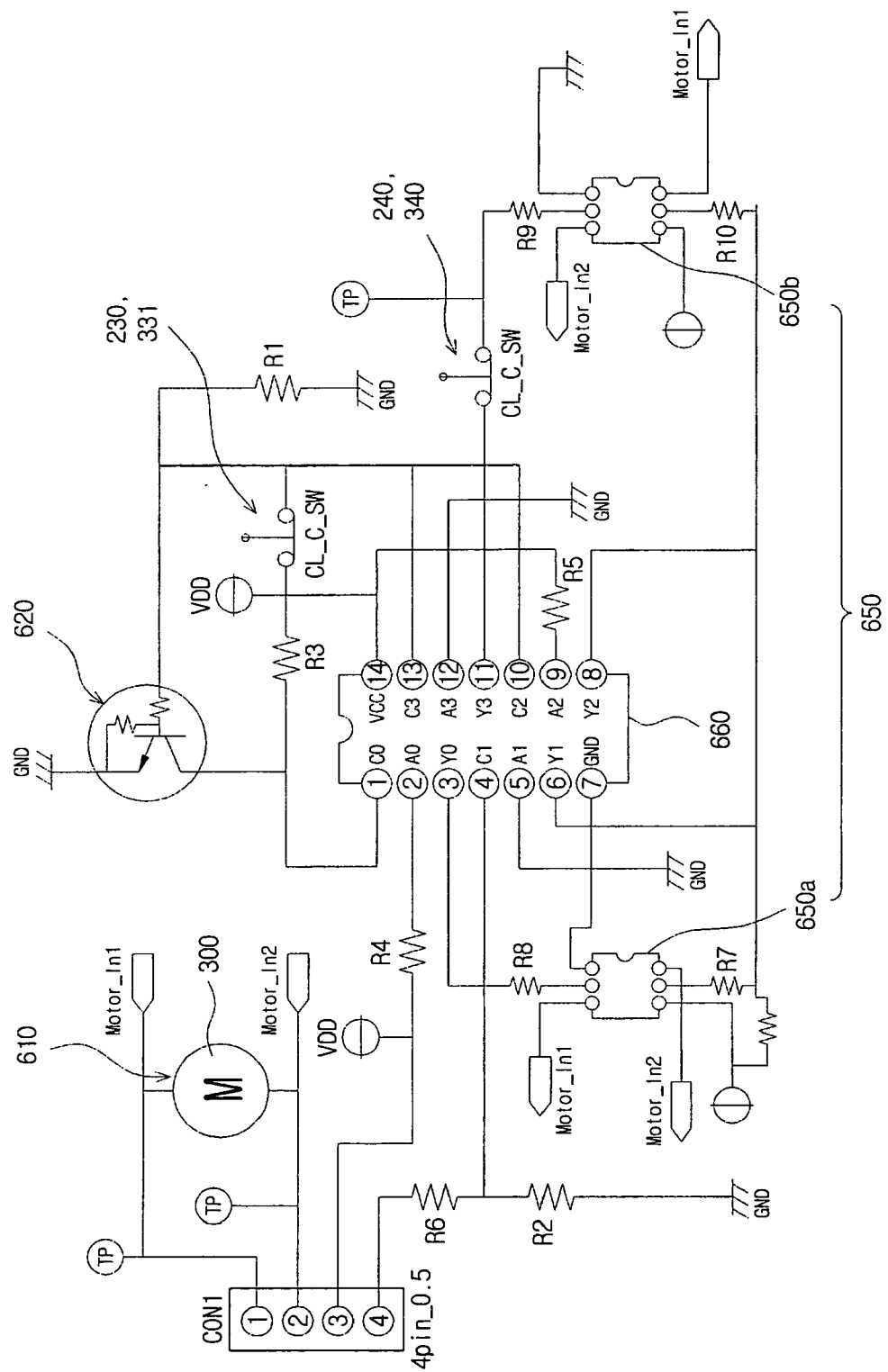


Fig. 7

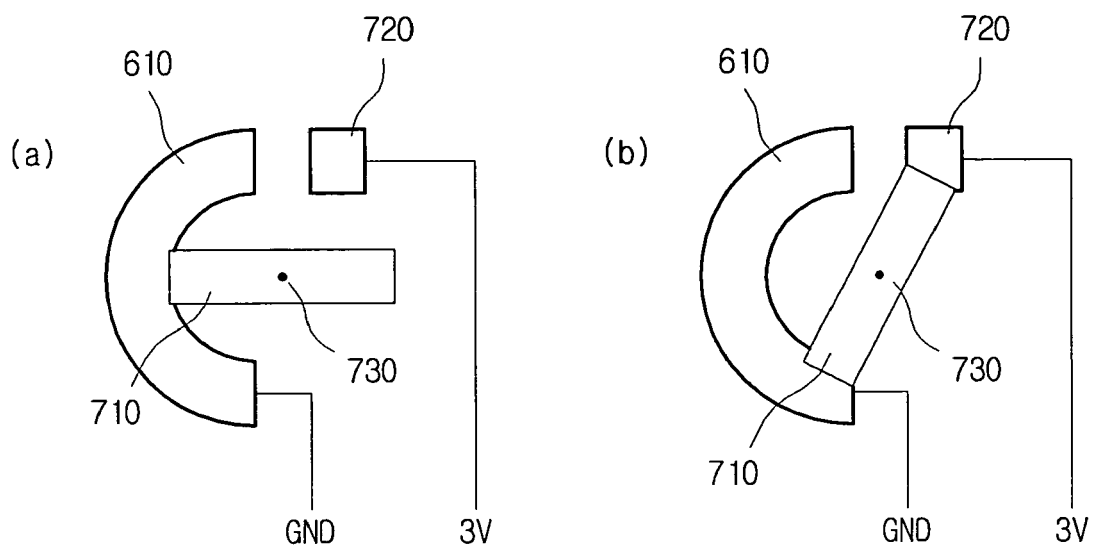
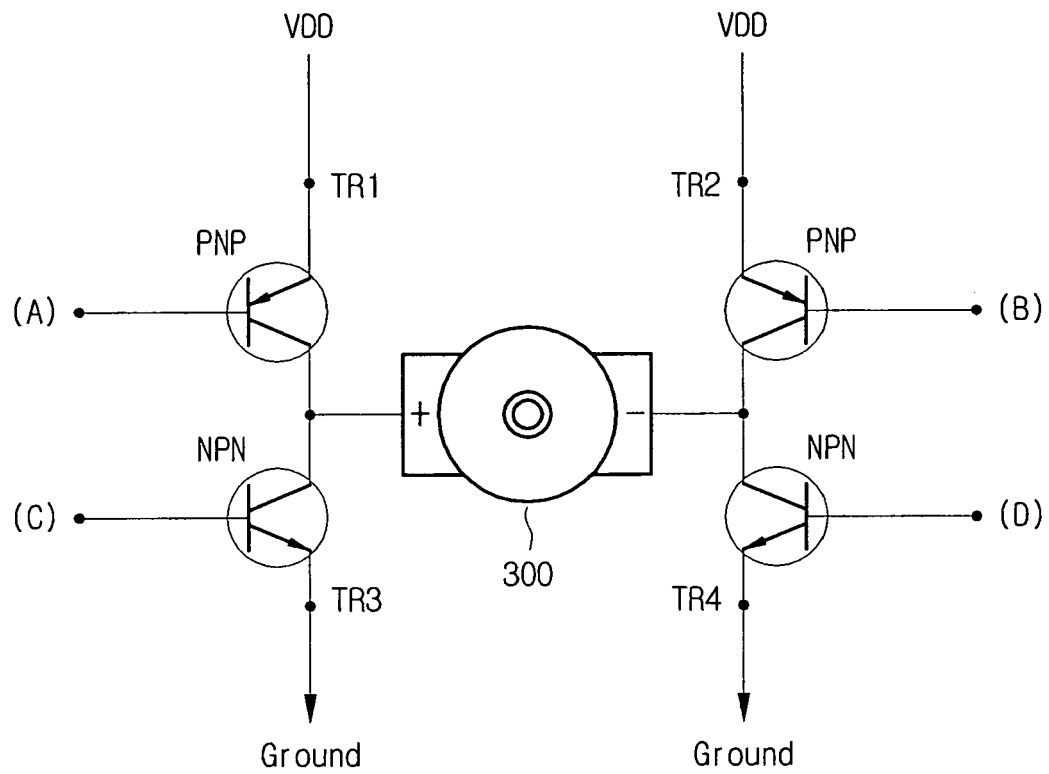


Fig. 8



A	B	C	D	Function
H	L	L	H	Forward rotation
L	H	H	L	Reverse rotation
H	H	L	L	Stop
L	L	H	H	Stop

Fig. 9

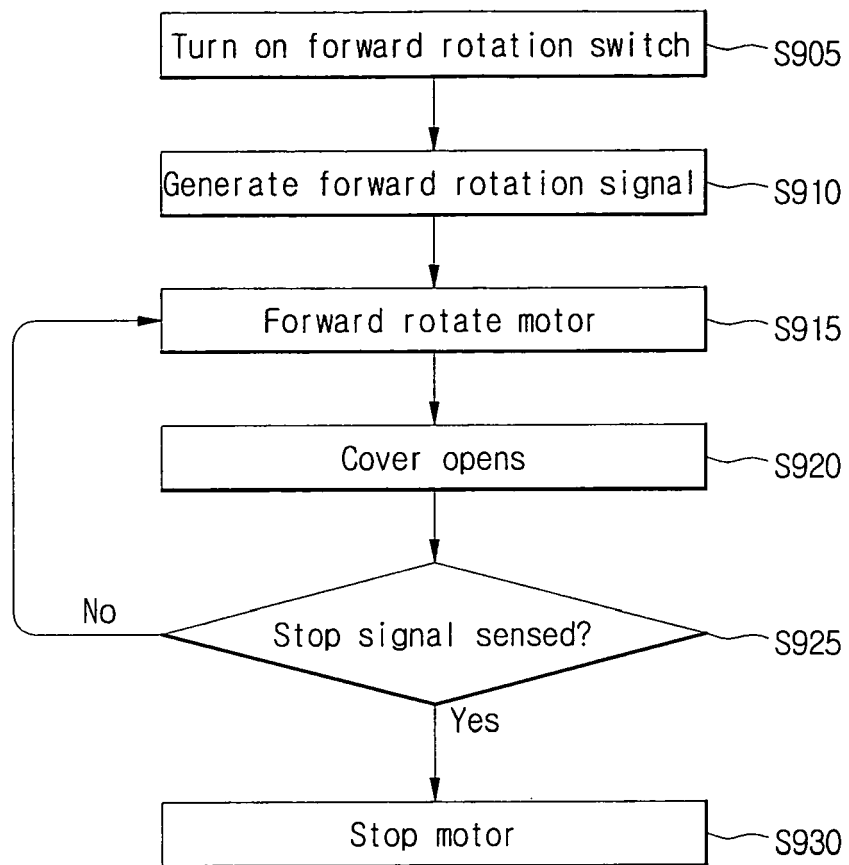


Fig. 10

